winds. It changed direction to the northeast near to and south of Galveston, Tex., and passed to the east Gulf coast, causing severe gales. After the centre reached the vicinity of Mobile, Ala., the disturbance divided, one portion passing to the east of the Alleghany range and the other passing to the Ohio Valley. These disturbances united on the afternoon of the 23d, the centre being located on the middle Atlantic coast. It continued its northeasterly course during the 24th and 25th, reaching its maximum energy after the centre passed to the eastward of the coast line on the 24th, the maximum velocity of wind reported being 72 miles per hour at Block Island, R. I., and 48 miles per hour at Boston, Mass. On the morning of the 26th it was last observed as central to the southeast of Nova Scotia.

IX.—This storm also originated on the Pacific coast, although it was first located as central north of Idaho on the afternoon of the 20th. It passed to the east of the Rocky Mountains on the 21st, moved southward over Montana and the Dakotas on the 27th, and thence eastward to the region north of Lake Superior, where it disappeared during the 23d.

X.—Apparently developed over the Atlantic to the east of North Carolina and in the vicinity of the Gulf Stream on the 26th, at least from the reports at hand it is impossible to trace it farther to the south. Northwesterly gales were reported at Hatteras, N. C., on the 26th, and northeasterly gales on the south New England coast on the 27th. It increased in intensity during its northerly movement, the barometer falling to 28.88 at Halifax, N. S., when the centre of disturbance passed northward near that station on the 27th. On the regular telegraphic weather chart it was located as central near Bird Rocks, Gulf of Saint Lawrence, on the morning of the 28th. Additional information relative to this storm is given under the heading "North Atlantic Storms."

XI.—Developed in the upper lake region and was probably a secondary disturbance attending the storm previously described. It moved southeastward to the lower lake region during the night of the 28th, attended by general rains throughout the Northern States and light snows in the upper lake region. It passed eastward over the middle Atlantic states during the 29th, and thence northeastward over New England and the lower Saint Lawrence valley, where it was central on the morning of the 30th, attended by easterly gales over the Gulf of Saint Lawrence and strong westerly winds on the New England and middle Atlantic coasts.

NORTH ATLANTIC STORMS FOR OCTOBER, 1890 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the storms that appeared over the north Atlantic Ocean during October, 1890, are shown on chart I. These paths have been determined from international observations by captains of ocean steamships and sailing vessels received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Ten storms have been traced for October, 1890, the average number traced for the corresponding month of the last 7 years being 12. Of the storms traced for the current month 6 advanced eastward from the American continent, 2 apparently developed over mid-ocean, one is first located over the Banks of Newfoundland, and one appeared off the middle Atlantic coast. The storms generally moved northeastward after passing the 50th meridian, and no storms were traced from coast to coast. No well-defined cyclones appeared over or near the West Indies.

In October during the last 17 years 8 severe storms advanced northward from the Caribbean Sea. The storms generally recurved over or near extreme western Cuba and the east part of the Gulf of Mexico and passed thence along or off the Atlantic seaboard to the vicinity of Newfoundland. In two instances, only, during this period, in 1886 and 1887, have storms of pronounced strength advanced from the Caribbean Sea over the Gulf of Mexico west of the 90th meridian in October. In October, 1889, terrific gales swept over the British Isles on the 7th, causing many shipwrecks; in the northern parts of England and Ireland many houses were demolished and numerous trees uprooted, and the barometer fell below 28.70 (729) over Scotland. October is a month of severe storms in the middle latitudes of the north Atlantic Ocean. In the current month severe storms prevailed west of the 30th meridian during a greater part of the month, while over the eastern part of the ocean and near the British Isles the weather was unusually fine and settled for the season.

October, 1890, opened with a storm of great energy central northeast of Newfoundland, with pressure below 29.00 (737) and strong to whole gales. By the 2d this storm had moved northeast to about the 32d meridian, without evidence of loss of energy, after which it disappeared north of the region of observation. A telegram from Havana, Cuba, received 12.40 p. m. of the 1st, stated that a disturbance of moderate energy was southwest of that station, and a telegram received 3.20 p. m. of the 2d stated that a disturbance was west of Havana. Disastrous gales were reported over the North Sea on the 2d and 3d. From the 3d to 5th a storm of moderate strength moved northeastward about midway between the Azores and the Grand Banks, after which it apparently recurved westward and united with a storm central near Newfoundland on the 6th. During the 5th and 6th a storm moved from Nova Scotia to off the southern extremity of Newfoundland, with fresh to strong gales and pressure below 29.40 (747), after which it advanced rapidly northeastward and disappeared north of the region of observation after the 7th. On the 7th a storm, with pressure below 29.50 (749) and fresh gales, was central over the Grand Banks, from which position it passed eastward to about the 38th meridian by the 8th, with pressure below 29.10 (739) and fresh to strong gales, after which it disappeared north of the region of observation. On the 8th a storm which had moved off the middle Atlantic coast during the 7th was central off the south New England coast, whence it moved eastward to south of the Grand Banks by the 9th, with pressure below 29.40 (747) and fresh to strong gales. By the 10th this storm had moved northeastward to east of the Grand Banks, with pressure below 29.00 (737) and heavy gales, after which it moved northeastward and disappeared in the direction of Iceland after the 12th. During the 11th and 12th a severe storm advanced from the Gulf of Saint Lawrence to south of Newfoundland, attended by disastrous gales over the Gulf of Saint Lawrence, Cape Breton Island, and eastern Nova Scotia. During the 13th and 14th this storm remained nearly stationary over the Banks of Newfoundland, with pressure falling to about 29.20 (742) and fresh to strong gales, and on the 15th was central off the southeast extremity of Newfoundland, with a slight loss of energy. By the 16th this storm had moved north-northeast beyond the region of observation. The eastward advance of this storm was apparently retarded during the 13th and 14th by high pressure to the eastward.

On the 15th and 16th the pressure was low over the British Isles and severe gales were reported over the Irish Sea and along the coasts of Great Britain. On the 17th a severe storm moved northeastward off the New England coast, with pressure below 29.40 (747) and heavy gales. On the 18th this storm was central south of Newfoundland, where there was an apparent increase in energy, and by the 19th the storm centre had moved to the east of the Grand Banks, after which it passed northeast and disappeared north of the region of observation, attended throughout by storms of great violence. During the 19th a storm moved eastward off the south New England coast, and on the 20th was central off the western extremity of Nova Scotia, with pressure below 29.40 (747) and

fresh to strong gales. By the 21st this storm had advanced to south of Newfoundland, where a loss of energy was shown, after which it moved eastward and apparently dissipated. During the 21st and 22d a storm of considerable strength moved eastward over the north part of the Gulf of Mexico, and on the 23d was central off the south and middle Atlantic coasts. During the 24th and 25th this storm moved eastward south of the 40th parallel to the 65th meridian, with pressure below 29.40 (747) and fresh to strong gales. By the 26th the storm had moved to the west edge of the Grand Banks, with an apparent increase in energy, after which it recurved northward and probably united with a storm which moved northward over Nova Scotia during the night of the 27–28th. Mr. Jos. Ridgway, jr., observer, Saint Thomas, W. I., reports, under date of the 26th, "that the barometer had been falling at Saint Thomas since the 20th, reaching the lowest point, 29.89 (759), at 5 p. m., 25th. The morning of the 24th the wind was easterly, and later in the day it veered to se., and on the 25th it veered from se. to sw. The tide had been unusually high for several days." These conditions were probably due to the storm which moved from the Gulf of Mexico along the Atlantic coast from the 21st to 26th. On the 27th a storm of considerable energy, with pressure below 29.20 (742), appeared between Nova Scotia and Bermuda, whence it moved northward to the Gulf of Saint Lawrence by the 28th, with pressure below 29.00 (737) and heavy gales, after which it disappeared north of the region of observation. During the 30th and 31st a storm moved northeastward over the Canadian Maritime Provinces and the Gulf of Saint Lawrence and disappeared north of Newfoundland, with pressure below 29.30 (744) on the 30th.

FOG IN OCTOBER.

The limits of fog-belts west of the 40th meridian, as determined from reports of shipmasters, are shown on chart I by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on 19 dates; and between the 55th and 65th meridians on 3 dates. No fog was reported west of the 65th meridian. Compared with the corresponding month of the last 3 years the dates of occurrence of fog near the Grand Banks numbered 6 more than the average; and between the 55th and 65th meridians 2 less than the average. West of the 65th meridian the average number of days for which fog was reported for the last 3 years is 3. On the dates fog was reported east of the 65th meridian it occurred with the approach or passage to the northward of general storms. Dense fog was reported at New York City on the 23d and 24th with the advance along the middle Atlantic coast of a general storm.

OCEAN ICE IN OCTOBER.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for October during the last 8 years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
	° ′	° ′		° ′	° ′
October, 1883	46 56	46 22	October, 1883	46 56	46 22
October, 1884	Off Cape	Race.	October, 1884	46 56	50 55
October, 1885	48 21	47 12	October, 1885	48 21	47 12
October, 1886	41 34	49 43	October, 1886	46 03	46 37
October, 1887	42 58	50 02	October, 1887	42 58	50 02
October, 1888	51 43	55 36	October, 1888	51 43	55 36
October, 1889	44 32	49 28	October, 1889	46 30	45 59
October, 1890	44 47	49 33	October, 1890	47 56	45 45
Mean	45 55	50 11	Mean	47 10	48 33

For the current month ice was reported more than 1° south and nearly 3° east of the average southern and eastern limits of ice for October, as determined from reports of the last 7 years. The southernmost ice reported was a medium sized iceberg noted on the 13th in the position given, and the easternmost ice reported was a large iceberg noted on the 5th in the position given. The iceberg of the 5th, referred to, was east of the extreme eastern limit of ice for October as shown by reports of the last 7 years. As is usual in October ice was most frequently encountered along the east edge of the Banks of Newfoundland north of the 45th parallel, and in and east of the Straits of Belle Isle. In quantity the ice reported for the current month exceeded the average for October.

The limits of the region within which Arctic ice was reported for October, 1890, are shown on chart I by ruled shading.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

Many of the voluntary stations do not have standard thermometers or shelters.

The distribution of mean temperature over the United States and Canada for October, 1890, is exhibited on chart II by dotted isotherms. In the table of Signal Service data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

The mean temperature was highest over south Florida and in the lower Rio Grande valley, where it was above 75, and the mean values were above 70 over the Florida Peninsula, along the west Gulf coast, and in the lower Rio Grande valley. South of a line traced from the South Carolina coast irregularly westward to central Texas, and thence southwestward to the middle Rio Grande valley, over the southwest part of the southern plateau, in southern California, and at stations in the San Joaquin and Sacramento valleys the mean temperature was above 65. The mean temperature was lowest at elevated stations in central Colorado, where it was below 35, and the mean readings were below 40 in the lower Saint Lawrence valley, in extreme northwest Michigan, northeast Minnesota, and in the Saskatchewan Valley.

The mean temperature was above the normal over the northern portion of the country from east Washington to the Gulf of Saint Lawrence, along the Pacific coast south of the 40th parallel, over the southwest part of the plateau region, on the southeast slope of the Rocky Mountains, in the lower Rio Grande valley, and over south Florida; elsewhere the month was cooler than usual. The greatest departures above the normal temperature were noted in Manitoba and on the south Pacific coast, where they ranged to 4.7 at Minnedosa, Man., and to 4.8 at Los Angeles, Cal. The most marked departures below the normal temperature were reported in the interior of Alabama and Georgia, and in eastern Tennessee, where they equalled or exceeded 3.0.

The warmest October along the middle and south Atlantic coasts and in Florida occurred in 1881, when the mean temperature was 3 to 5 above the normal; from the northeast and middle-eastern slopes of the Rocky Mountains eastward over the Ohio Valley, the Lake region, New York, and New England, in 1879, when the mean temperature was 4 to 8 above the normal; from the Dakotas westward to the north Pacific coast in 1889, when the mean temperature was 4 to 6 above the normal; along the middle Pacific coast in 1887, when the mean temperature was 3 to 4 above the normal; and at Los Angeles, Cal., in 1890, when the mean was 4.8 above the normal and 1.5